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(54) Abstract Title

Combined barcode scanner, video camera and mobile telephone

(57) A portable communications terminal uses a single image sensor to scan barcodes and perform other image processing functions such as digital still or video photography or videotelephony. Information captured from a barcode may be transmitted from the mobile terminal via a communications link to an external network for applications such as retail price comparison. The terminal may be implemented as a single integrated unit such as a mobile videophone, or as multiple devices linked by a local wired or wireless communications link such as Bluetooth.

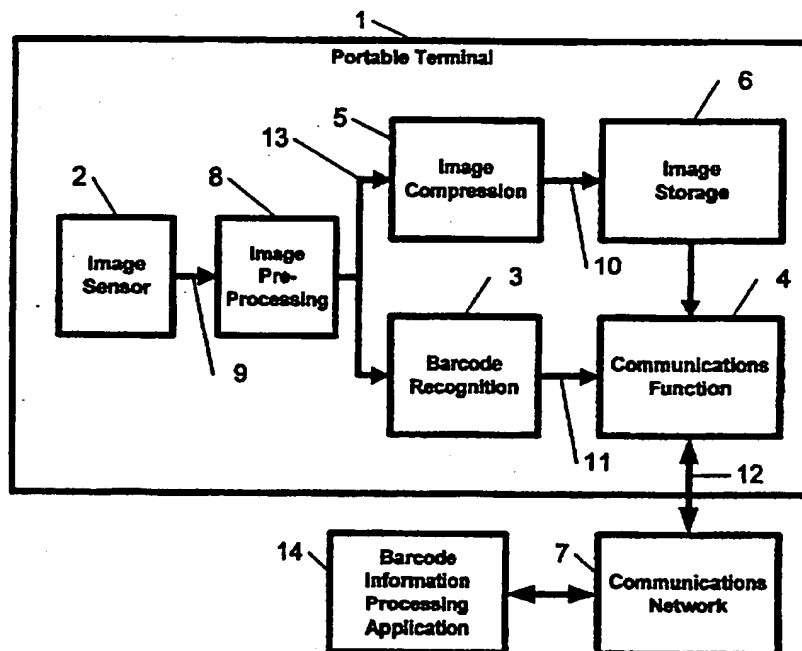


Figure 1

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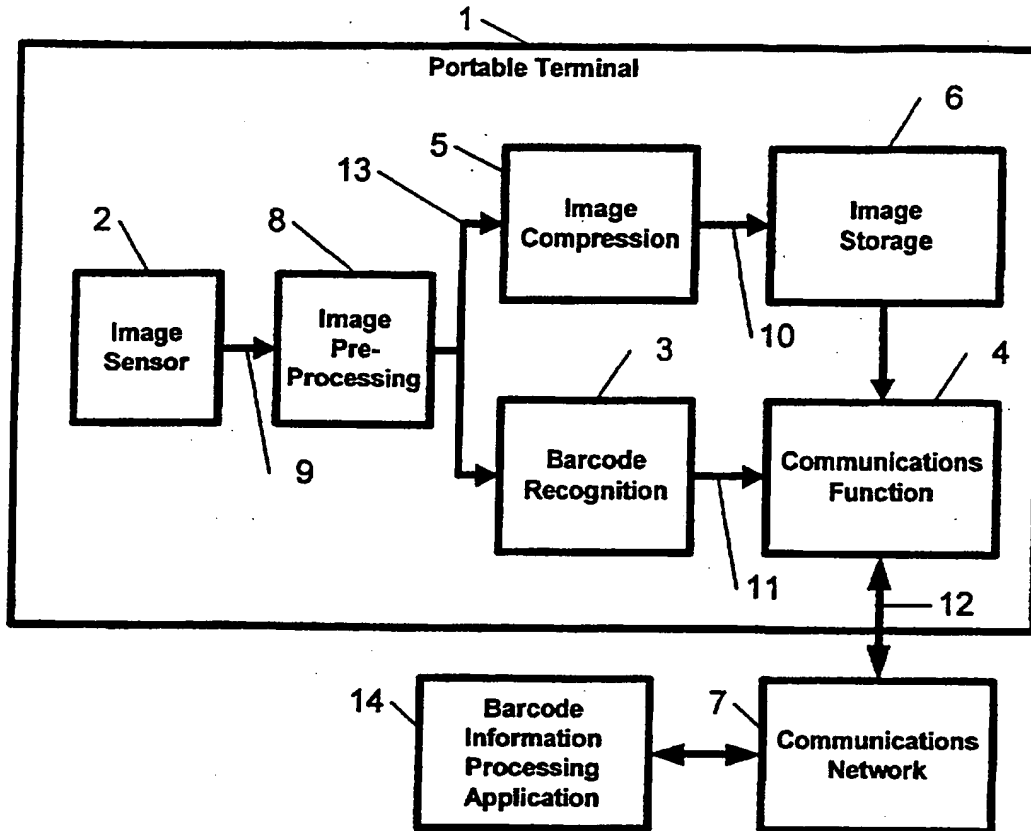


Figure 1

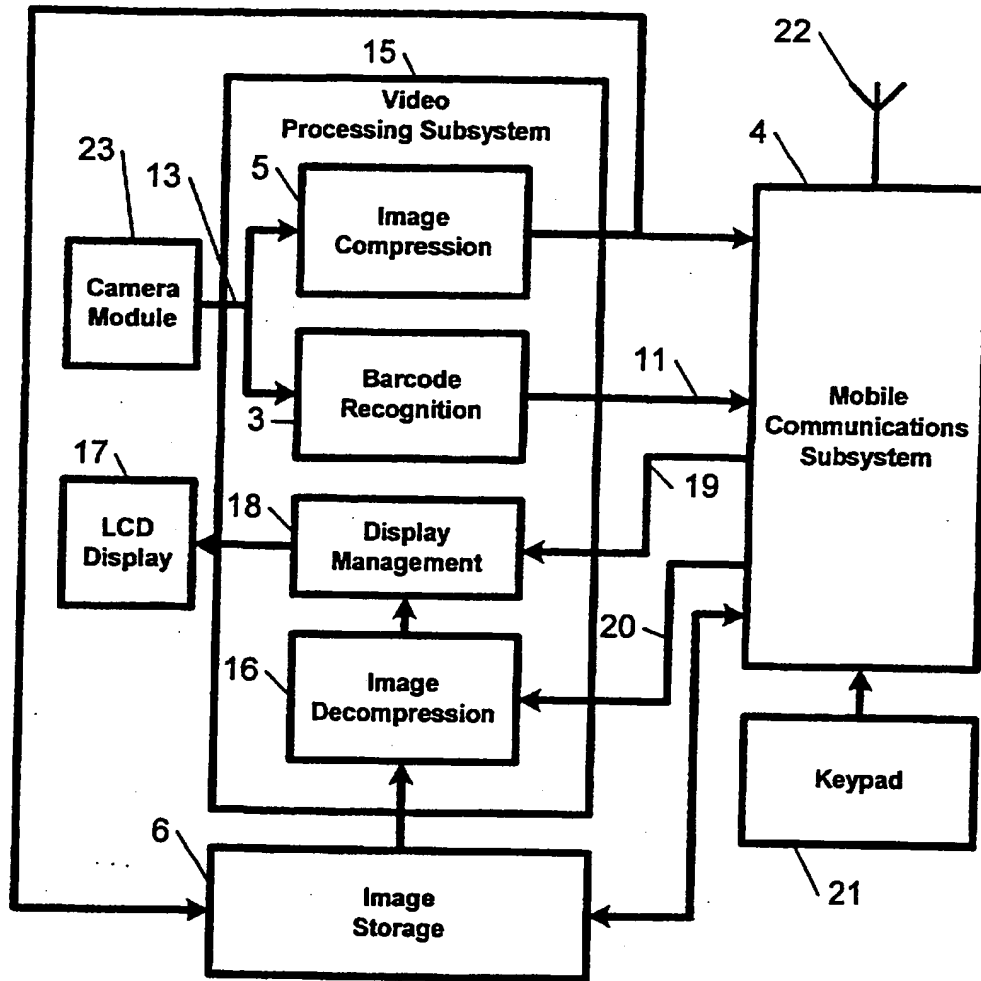


Figure 2

## COMBINED BARCODE SCANNER, VIDEO CAMERA, AND MOBILE TELEPHONE

This invention relates to a portable terminal that combines the functions of communication, barcode recognition, and other image processing functions such as still-picture or moving image recording.

Communications devices with integrated video processing capability, such as mobile videophones and cellular phones with integrated digital camera functionality, already exist and are starting to gain popularity. Many retail and industrial products are already labelled with machine-readable barcodes, often including the Universal Product Code (UPC). Technology already exists for machine recognition of barcodes using a camera image sensor and an image recognition function. Applications are also emerging which make use of communications and UPC information, for example a mobile internet service whereby a consumer with a mobile telephone can use the telephone keypad to enter the numeric UPC of an item they are considering purchasing, and quickly compare the price against that being offered by other retailers or mail-order companies. However, manual entry of the UPC by the consumer using a numerical keypad is inconvenient, time-consuming, and error prone.

The object of this invention is to provide a portable terminal which combines the functions of (i) fixed or mobile communications capabilities, (ii) image processing and (iii) barcode recognition

Accordingly, this invention is a portable communications terminal that includes a common image sensor (camera) that is used both for barcode recognition and other non-related image processing functions, such as digital still photography or videotelephony. Barcode information (such as the UPC) is sent via the terminal's communications link to an external application or service provider. Use of a common image sensor provides significant cost and size benefits compared with using a dedicated image sensor or laser scanner for barcode scanning.

The portable terminal may itself consist of a single integrated device, or several independent devices interconnected by a local wired or wireless communications network such as Bluetooth or IEEE 802.11.

A preferred embodiment of the invention will now be described with reference to the accompanying drawing in which:

Figure 1 illustrates the overall functionality of an example system

Figure 2 illustrates one potential implementation of the terminal

As shown in Figure 1, the portable terminal 1 contains an image sensor 2 which generates a video signal 9. The video signal 9 may optionally be preprocessed and/or

compressed by the image preprocessor block 8, to generate video signal 13. This video signal 13 is then passed to a barcode recognition function 3 and an image compression function 5, thereby allowing functions 3 and 5 to use a common image sensor 2.

Function 3 analyses the image from the sensor 2 to determine if a valid barcode is present in the image, extracts the barcode information, and outputs the information originally encoded in the barcode as a barcode information value 11.

The communications function 4 uses a wired or wireless communications link 12 to convey the barcode information value 11 to an external communications network 7, via which it is passed to a barcode information processing application 14. The application 14 may interact with the user of the portable terminal 1, for example by displaying information on a screen within the portable terminal 1.

The communications link 12 may for example use a second or third generation mobile telephony standard such as GSM, GPRS, CDMA or 3GPP, or a short range wireless standard such as Bluetooth or IEEE 802.11.

The video signal 13 is passed to the image compression function 5 and fixed or moving images are stored in the image storage unit 6, which may be implemented as local random access memory, or as removable storage. The user may also choose to transmit the images stored in unit 6 to the communications network via the communications function 12.

Figure 2 illustrates one potential implementation of the portable terminal 1 in a videophone terminal that uses the videophone camera to recognise UPC barcodes on retail packaging.

The terminal 1 consists of a video processing subsystem 15 and a mobile communications subsystem 4. The video processing subsystem 15 would typically be implemented on a dedicated video processing microcontroller although the subsystem 15 could also be implemented using software executing on the same microcontroller that is used for the mobile communications subsystem 4.

A camera module 23, which includes the image sensor 2 and preprocessing function 8, passes the video signal 13 to a video processing subsystem 15. When the user presses a key sequence on the mobile phone keypad 21, the barcode recognition function 3 in the video processing subsystem 15 is activated. When a valid barcode is recognised, the video processing subsystem 15 passes the UPC value 11 to the mobile communications subsystem 4. An application in the mobile communications subsystem processes the UPC value 11, and then sends it to the network-based barcode information processing application 14 via the mobile communications network 7 and the antenna 22. The application 14 may then provide information back

to the user via the mobile communications subsystem 4, which then displays it to the user on a display 17 using the display management function 18.

The videophone application in the portable terminal 1 is implemented using the video processing subsystem 15 to perform image compression 5 and decompression 6. The images are temporarily stored in the image storage unit 6 and transmitted to and from the communications network 7 by the mobile communications subsystem 4.

## CLAIMS

1. A portable communications terminal that uses a common image sensor to decode barcode information and also to process images for other purposes. The information extracted from the barcode is transmitted from the terminal to an external network using a data communications link.
2. A terminal as claimed in any preceding Claim where the communications link is a digital radio link
3. A terminal as claimed in any preceding Claim where the communications link conforms to an internationally recognised technical standard for mobile telephony
4. A terminal as claimed in any preceding Claim where the communications link is a wireless link complying to the Bluetooth standard
5. A terminal as claimed in any preceding Claim where the communications link is a wireless link complying with the IEEE 802.11 standard
6. A terminal as claimed in any preceding Claim where the image processing functions include digital still camera functionality
7. A terminal as claimed in any preceding Claim where the image processing functions include digital video camera functionality
8. A terminal as claimed in any preceding Claim where the image processing functions include videophone functionality
9. A terminal as claimed in any preceding Claim where the barcode recognition function can recognise Universal Product Code symbols
10. A terminal as claimed in any preceding Claim where the barcode recognition function can recognise 2-dimensional barcodes
11. A terminal as claimed in any preceding Claim where all functions of the portable communication terminal are integrated into a single device
12. A terminal as claimed in any preceding Claim where one or more functions of the portable communication terminal are performed by several interconnected devices.

13. A terminal as claimed in any preceding Claim where the communications functions include voice functionality